

CLAIMS

What is claimed is:

1. A multi fiber optic medical probe, comprising:
 - at least two optical fibers;
 - side-firing terminations for the at least two optical fibers; and
 - beam shaping apertures for controlling light propagating between the side-firing terminations and a region lateral to the probe.
2. A fiber optic medical probe as claimed in claim 1, wherein the at least two optical fibers comprise just two optical fibers.
3. A fiber optic medical probe as claimed in claim 1, wherein the at least two optical fibers comprises eight or more optical fibers.
4. A fiber optic medical probe as claimed in claim 1, wherein the at least two optical fibers comprise at least one single mode fiber and at least one multimode fiber.
5. A fiber optic medical probe as claimed in claim 1, wherein a core diameter of at least one of the optical fibers is less than about 10 micrometers and a core diameter of at least one other optical fiber of the at least two optical fibers is greater than 100 micrometers.
6. A fiber optic medical probe as claimed in claim 1, wherein the side firing terminations comprise angled endfaces for the at least two optical fibers.
7. A fiber optic medical probe as claimed in claim 6, wherein the angled endfaces are formed by polishing.
8. A fiber optic medical probe as claimed in claim 1, wherein the side firing terminations comprise at least one coreless block.

9. A fiber optic medical probe as claimed in claim 8, wherein the at least one coreless block comprises an angled endface.
10. A fiber optic medical probe as claimed in claim 9, wherein the at least one angled endface is formed by polishing.
11. A fiber optic medical probe as claimed in claim 9, wherein the at least one angled endface is metal coated.
12. A fiber optic medical probe as claimed in claim 8, wherein the at least one coreless block is attached to ends of the optical fibers.
13. A fiber optic medical probe as claimed in claim 8, wherein the at least one coreless block is fused to ends of the optical fibers.
14. A fiber optic medical probe as claimed in claim 1, further comprising at least one capillary tube over the side-firing terminations of the at least two optical fibers, at least one capillary tube providing the beam shaping apertures.
15. A fiber optic medical probe as claimed in claim 14, wherein the capillary tube comprises multiple bores for each of the at least two optical fibers.
16. A fiber optic medical probe as claimed in claim 1, further comprising capillary tubes over the side-firing terminations of the at least two optical fibers.
17. A fiber optic medical probe as claimed in claim 16, wherein the capillary tubes are attached to each other.
18. A fiber optic medical probe as claimed in claim 16, wherein the capillary tubes are bonded to each other.
19. A fiber optic medical probe as claimed in claim 16, further comprising a spacer block between the capillary tubes.

20. A fiber optic medical probe as claimed in claim 16, further comprising a wedge spacer between the capillary tubes for controlling an angle between the optical axes between the beam shaping apertures.
21. A fiber optic medical probe as claimed in claim 20, wherein the wedge spacer is integral with one of the capillary tubes.
22. A fiber optic medical probe as claimed in claim 1, wherein the beam shaping apertures are longitudinally offset along an axis of the probe with respect to each other.
23. A fiber optic medical probe as claimed in claim 1, further comprising at least three optical fibers, wherein one of the optical fiber is single mode fiber and other fibers are multimode fibers.
24. A method of gathering optical information using a medical probe, comprising:
 - transmitting an optical signal in a first optical fiber;
 - directing the optical signal to a region lateral to the probe with a side-firing termination to the first optical fiber;
 - controlling a beam shape of the optical signal;
 - collecting optical information with a second optical fiber and transmitting the optical information to an analyzer.
25. A method as claimed in claim 24, wherein the step of collecting optical information comprises collecting the optical information with multiple optical fibers.
26. A method as claimed in claim 24, wherein the step of transmitting the optical signal in the first optical fiber comprises transmitting the optical signal in single mode fiber.
27. A method as claimed in claim 24, wherein the step of collecting optical information comprises collecting the optical information with at least one multimode optical fiber.

28. A multi fiber optic medical probe, comprising:
 - at least one single mode optical fiber;
 - at least one multimode optical fiber;
 - side-firing terminations for the optical fibers having beam shaping apertures.
29. A fiber optic medical probe as claimed in claim 28, wherein the at least two optical fibers comprise just two optical fibers.
30. A fiber optic medical probe as claimed in claim 28, wherein the at least two optical fibers comprises eight or more optical fibers.
31. A fiber optic medical probe as claimed in claim 28, wherein a core diameter of the single mode optical fiber is less than about 10 micrometers and a core diameter of the multimode fiber is greater than 100 micrometers.
32. A fiber optic medical probe as claimed in claim 28, wherein the side firing terminations comprise angled endfaces for the at least two optical fibers.
33. A fiber optic medical probe as claimed in claim 32, wherein the angled endfaces are formed by polishing.
34. A fiber optic medical probe as claimed in claim 28, wherein the side firing terminations comprise at least one coreless block.
35. A fiber optic medical probe as claimed in claim 34, wherein the at least one coreless block comprises an angled endface.
36. A fiber optic medical probe as claimed in claim 35, wherein the at least one angled endface is formed by polishing.
37. A fiber optic medical probe as claimed in claim 36, wherein the at least one angled endface is coated.

38. A fiber optic medical probe as claimed in claim 34, wherein the at least one coreless block is attached to ends of the optical fibers.
39. A fiber optic medical probe as claimed in claim 34, wherein the at least one coreless block is fused to ends of the optical fibers.
40. A fiber optic medical probe as claimed in claim 28, further comprising at least one capillary tube over the side-firing terminations of the at least two optical fibers, at least one capillary tube providing the beam shaping apertures.
41. A fiber optic medical probe as claimed in claim 40, wherein the capillary tube comprises multiple bores for each of the at least two optical fibers.
42. A fiber optic medical probe as claimed in claim 28, further comprising capillary tubes over the side-firing terminations of the at least two optical fibers.
43. A fiber optic medical probe as claimed in claim 42, wherein the capillary tubes are attached to each other.
44. A fiber optic medical probe as claimed in claim 42, wherein the capillary tubes are bonded to each other.
45. A fiber optic medical probe as claimed in claim 42, further comprising a spacer block between the capillary tubes.
46. A fiber optic medical probe as claimed in claim 42, further comprising a wedge spacer between the capillary tubes for controlling an angle between the optical axes between the beam shaping apertures.
47. A fiber optic medical probe as claimed in claim 46, wherein the wedge spacer is integral with one of the capillary tubes.